EFiRON®

Optical Solution Provider

Technical Data Sheet

EFIRON®

Ribbon Matrix Series

UVF-R1000

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Rev. 07
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The Term of Validity: July 8. 2014~ July 8. 2016

Contents

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A. INTRODUCTION

EFIRON® coating series are radiation-curable acrylates useful for optical fiber coating processes. **EFIRON®** Ribbon Matrix coating series has suitable glass transition temperature, rapid cure property, non-yellowing, thermal resistance, high oxidative and hydrolytic (moisture) stability, which are required by optical fiber industry applications. **EFIRON®** Ribbon Matrix coating series can be easily removed from the cladding without damage to the optical fibers for splicing and connection procedures.

Introduction of UV curing Reaction

The free radical mechanism is the primary UV curing reaction. It is similar for both UV and EB systems. The difference between the two is the means by which these radicals are generated. The mechanism for UV curing is as follows:

Step 1. When the coating is exposed to UV radiation in the wavelength range of 200 ~ 400 nm the photoinitiator is excited and subsequently breaks down, forming free radicals.

Step 2. The free radicals react with double bonds in the UV curing system to form propagating chain species. This step is crucial since it governs the rate of reaction and therefore the cure speed of the coating.

Step 3 & 4. The final step is chain transfer and/or termination. At this point the polymerization ends as the reactive sites are terminated by large, relatively less reactive chains, or by dual free radical additions to the carbon-carbon double bond.

B. MATERIAL INTRODUCTION

B-1. Curing conditions

EFIRON® Ribbon Matrix coating series has fast cure speed so it can be applied to 600 m/min line. The minimum UV dose for complete cure is about 0.2~0.3 J/cm^2 (with D-bulb) under a nitrogen environment.

B-2. Notes

The information contained herein is believed to be reliable but is not to be taken as representation, warranty or guarantee, and customers are urged to make their own tests.

B-3. Recommended Storage

Guarantee of quality: 12 months at 25℃.

EFIRON® UVF coating series can be polymerized under improper storage conditions. Store materials away from direct sunlight and presence of oxidizing agents and free radicals. Storage temperature range should be 10 ~ 40℃.

B-4. Characteristics

* Excellent Strippability
* Excellent Breakout Properties
* Low Attenuation
* Ease of Spooling
* Good Modulus
* Chemical Resistance

C. Material Properties

EFIRON® Ribbon Matrix R-1000

C-1. Liquid Properties

Test at 50% R.H.		***Typical Properties***
Viscosity	at 25ºC	4,300 cps
	at 30ºC	2,600 cps
	at 35ºC	1,600 cps
	at 40ºC	1,000 cps
	at 45ºC	700 cps
	at 50ºC	500 cps

Test at 23ºC, 50% R.H	
Density at 23℃	1,100 kg/m^3
Refractive Index at 25ºC	1.508
Surface Tension at 25℃	20 dynes/cm

C-2. Cured Properties

Test at 23ºC, 50% R.H.	
UV Dose for 95% Secant Modulus, (by test A)	0.19 J/cm^2
Cure at 1.0 J/cm^2, D-bulb	
Secant Modulus at 2.5% Strain, (by test A)	70 kgf/mm^2
Tensile Strength at Break, (by test A)	2.5 kgf/mm^2
Elongation at Break, (by test A)	30 %
(Test A is one of **EFIRON®** test methods)	
Refractive Index of film (633nm)	1.53
Test at <1% R.H., Cure at 1.0 J/cm^2, D-bulb	
Glass Transition Range, ºC at:	
Tg	65 ºC
Cure at 1.0 J/cm^2, D-bulb	
Hydrogen Generation	
after 24hs at 80 ºC (㎕/g) in argon	0.2
Coefficient of Expansion (TMA)	
Glassy Region	116 /ºC
Rubbery Region	171 /ºC
Thermal Weight Change (1,500 Hrs / 90ºC)	2.5
Shrinkage on Cure	3.6%
Soxhlet Extractions with MEK	2.5 %
Coefficient of Friction	<80
Water Sensitivity (250 ㎛ film, 24 Hour, 50 ºC)	
Absorption	1.4 %
Extractable	0.4 %

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* Film preparation in Test A of **EFIRON®** test methods: 75 ㎛ film thickness, D-bulb, 2.5 J/cm^2 (UV-A: 1.12, UV-B: 0.38, UV-C: 0.04, UV-V: 0.96) with Nitrogen Box.
* Unit Conversions: Kgf/mm^2= MPa x 0.102, Kgf = N x 0.102

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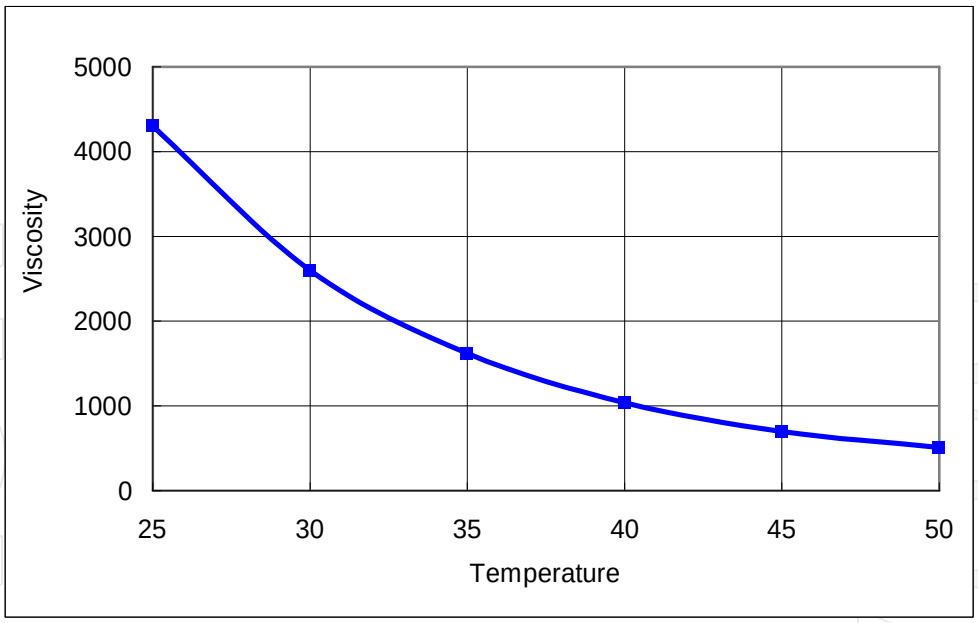
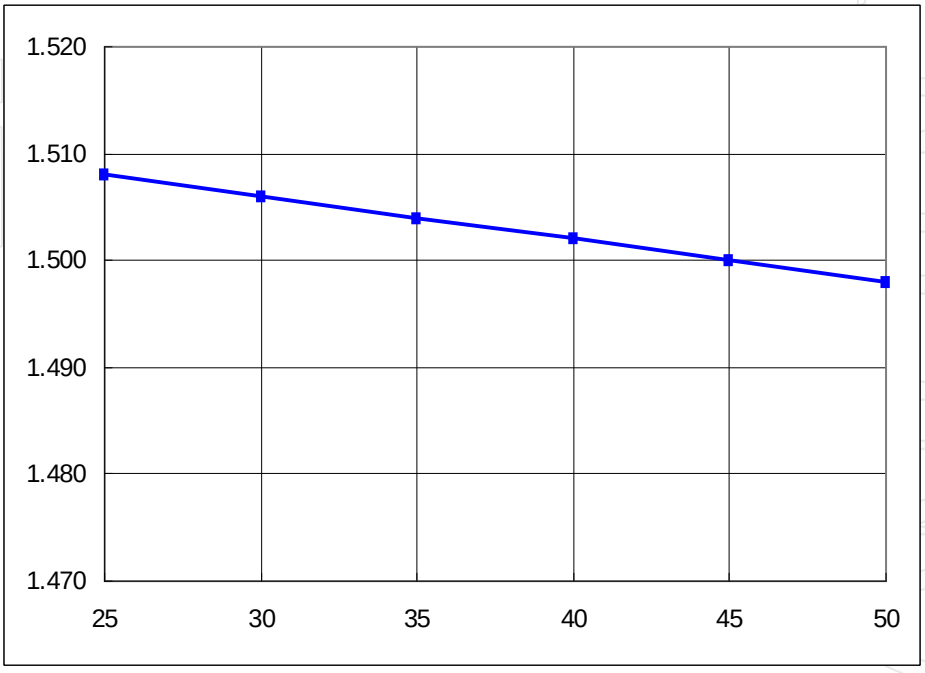
D. GRAPH & TABLE RELATED DATA

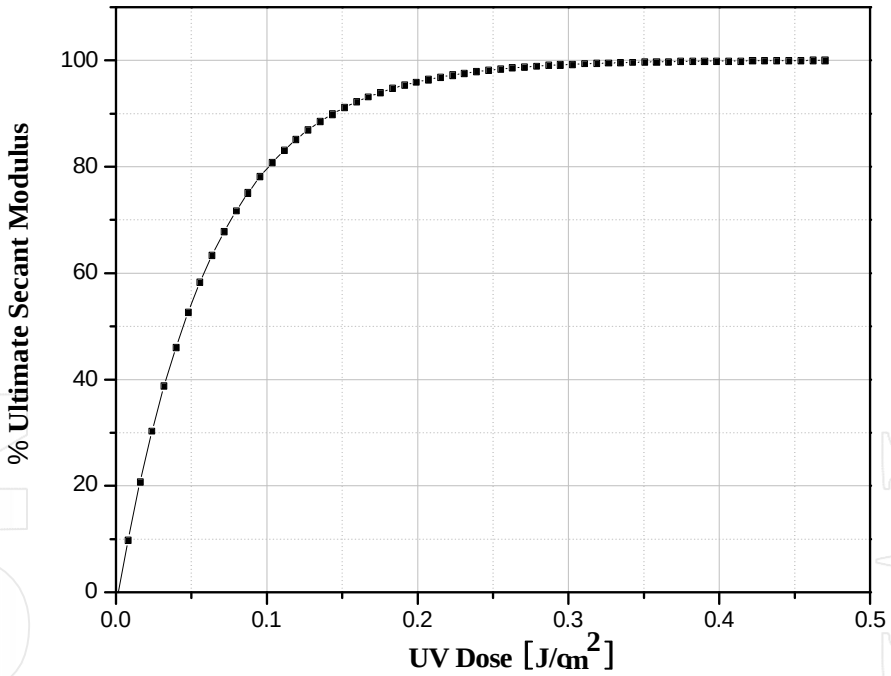
D-1. Viscosity *vs.* Temperature



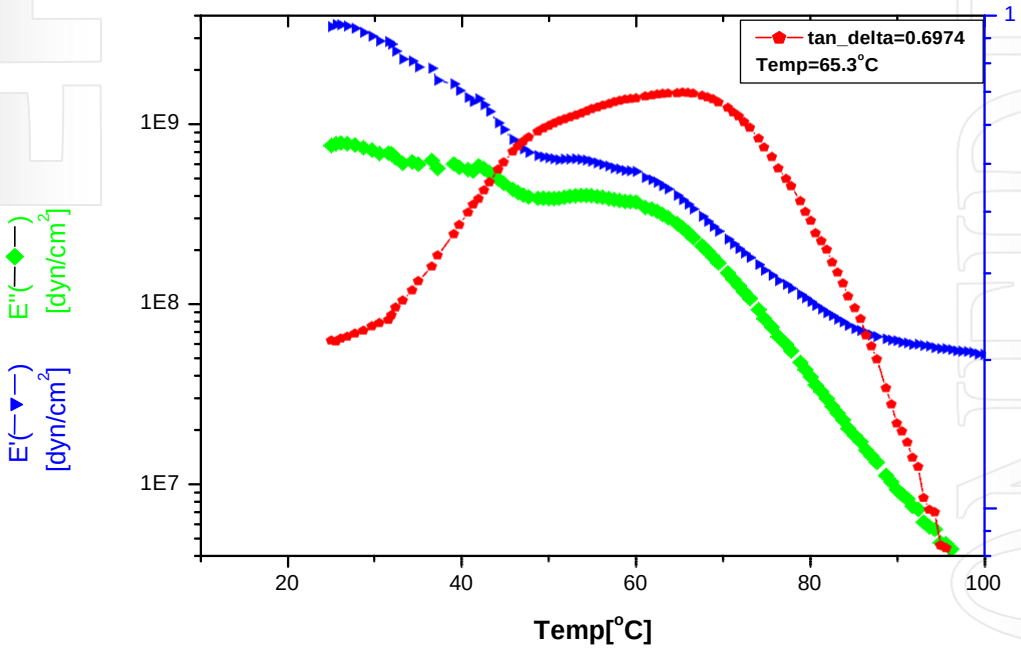
Refractive Index *vs.* Temperature



D-3. Cure Speed



D-4. Dynamic Mechanical Analysis



E. TEST EQUIPMENT

Property	**Equipment**
Viscosity (cps)	Brookfield DV III+
Refractive Index	Abbe refractometer
Density (kg/m^3)	Pycnometer
Surface Tension (dynes/cm)	Surface Tension Sedimentation Dynometer
N.V (%)	Weighing dish, Convection Oven
Shrinkage On Cure	Pycnometer
Solvent Extraction (Soxhlet)	Extraction Equipment
2.5% Secant Modulus (kgf/mm^2)	Instron 4443 UTM
Elongation (%)	Instron 4443 UTM
Tensile Strength (kgf/mm^2)	Instron 4443 UTM
Tg (℃)	DMTA / DSC
Adhesion Force to Glass (kgf)	Instron 4443 UTM
Thermal Expansion Coefficient	TMA

F. TEST METHODS

Property	**Method**
Viscosity (cps)	ASTM D-1084 Method B
Refractive Index	ASTM D 542 – 50
Density (kg/m^3)	ASTM 1475
Surface Tension (dynes/cm)	ASTM D-1331-56
Shrinkage On Cure	ASTM D-792
Soxhlet Test	Solvent Extraction
2.5% Secant Modulus (kgf/mm^2)	ASTM D-638
Elongation (%)	ASTM D-638
Tensile Strength (kgf/mm^2)	ASTM D-638
Adhesion Force to Glass (kgf)	ASTM D 1876-72
Tg (℃)	DMTA Test
Thermal Expansion Coefficient	TMA Test